# PROGRAMMING CYCLE

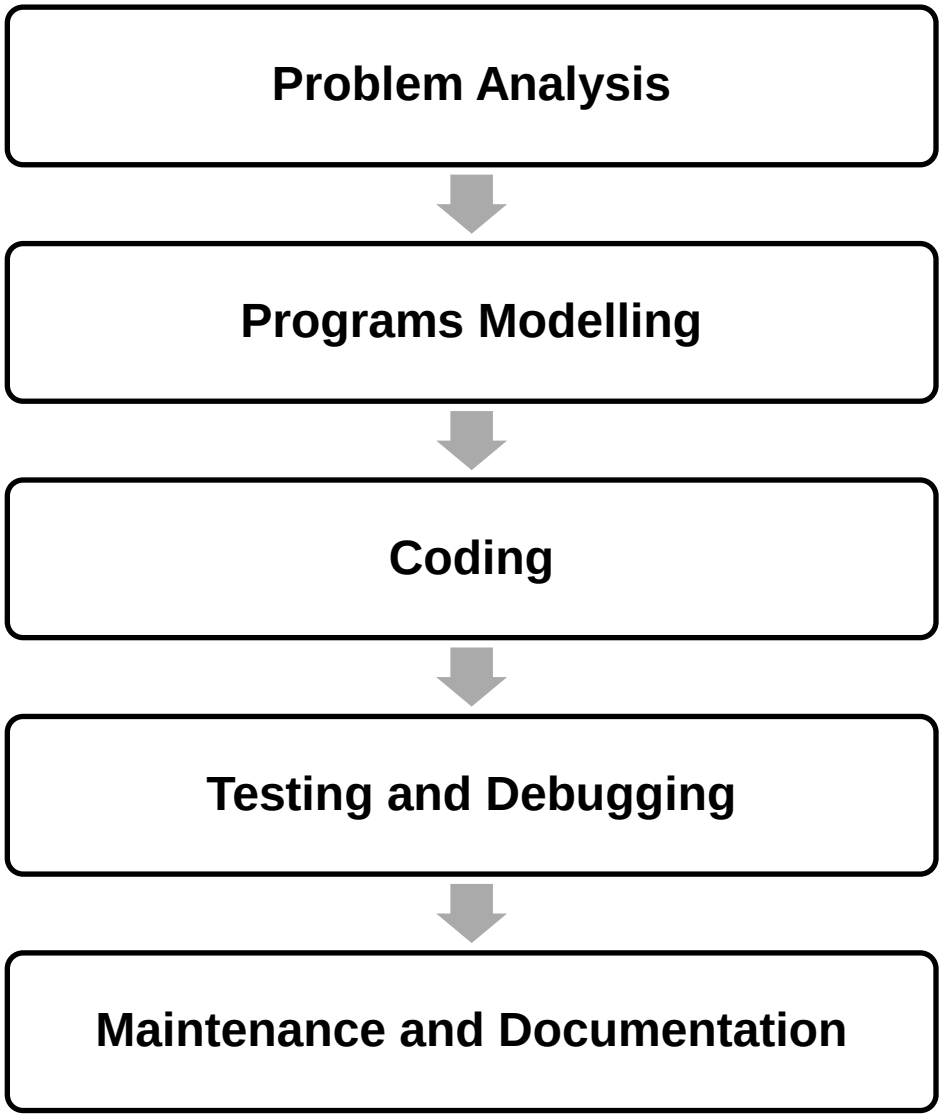
# Learning Outcomes

At the end of this lesson, students should be able to:

- Explain the phases of programming life cycle
- Desrcibe program algorithm using pseudo code and flowchart
- Solve problem in programming
- Identify good practices in programming

# PROGRAMMING LIFE CYCLE

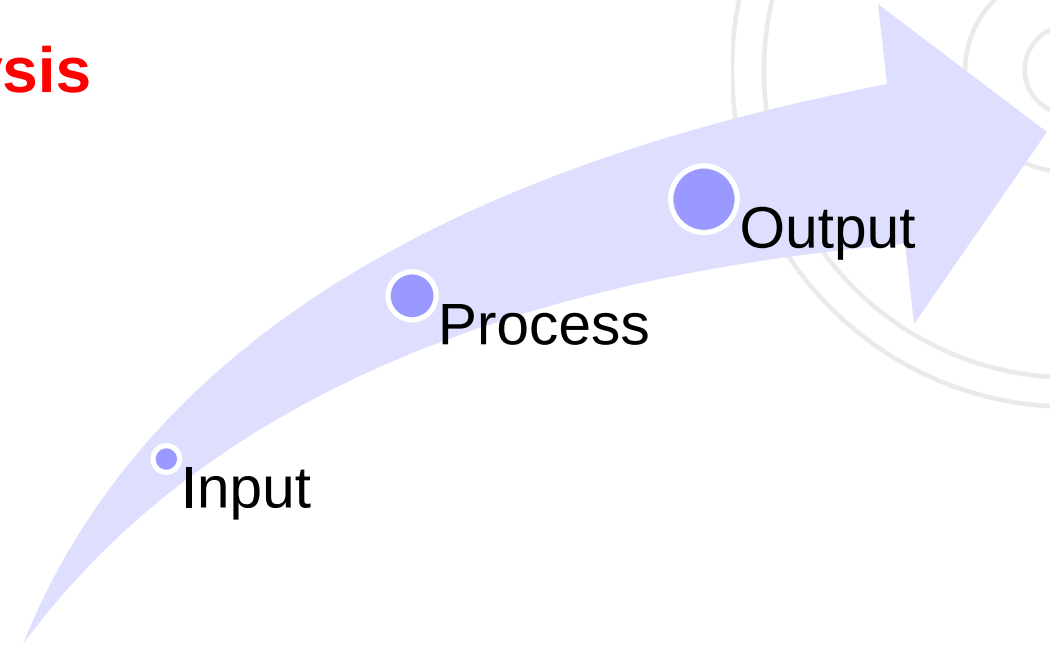
# Programming Life Cycle



# Programming Life Cycle

## Phase 1: Problem Analysis

- Defining the problem
- Identify:
  - Input (given data)
  - Output (the result)
  - Process:
    - Relation between input and output
    - Using formula



# Programming Life Cycle

## Phase 1: Problem Analysis

**Problem:**

Write a program that can input 3 integer number from user. Find the average for the number. Display all the numbers and the average.

**Problem Analysis:**

- Input: 3 integer numbers
- Process: 1. Total up the 3 integer numbers
  2. Divide the total by 3.
- Output: 3 integer numbers and the average

# Programming Life Cycle

## Phase 2: Programs Modelling

- Planning the solution to the program
- Using **algorithm**, **flowchart** or **pseudo code**

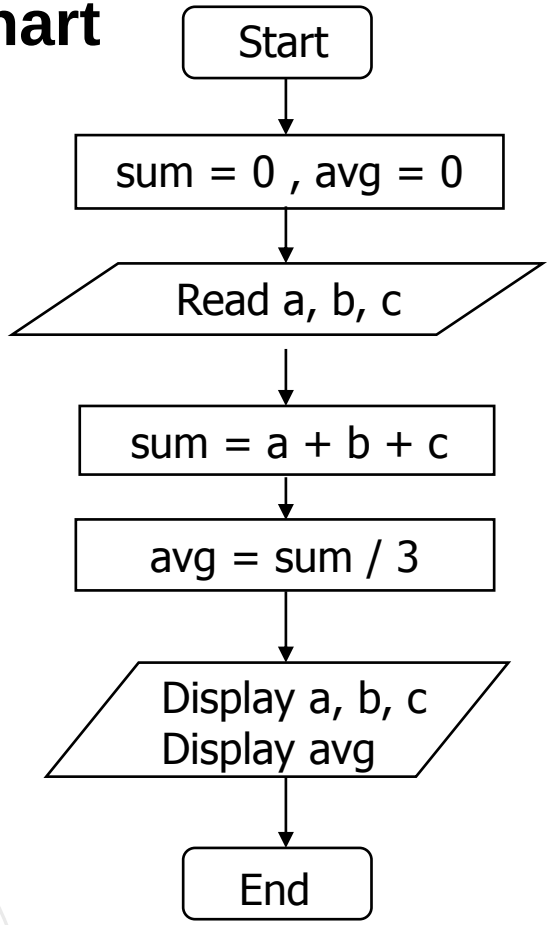
**1. Algorithm** (in simple English)

1. Set sum = 0, avg = 0
2. Read 3 integer number
3. Total up 3 integer number: sum = a + b + c
4. Find the average: avg = sum / 3
5. Display 3 integer number and average

# Programming Life Cycle

## Phase 2: Programs Modelling

### 2. Flowchart




### 3. Pseudo Code

```
START
    INPUT a, b, c
    sum = a + b + c
    avg = sum / 3
    PRINT a, b, c
    PRINT avg
END
```

# Programming Life Cycle

## Phase 3: Coding

- Express solution in a programming language
- Creating program source code
- Translate the logic/algorithm from the flowchart or pseudocode
- Each programming language has its own syntax (rules of language)

# Programming Life Cycle

## Phase 3: Coding

**C++**

```cpp
#include <iostream>

using namespace std;

int main()
{
    int a,b,c,sum;
     float avg;

     sum = 0; avg = 0;

     cout<<"Enter 3 integer numbers:"<<endl;
     cin>>a>>b>>c;

     sum = a + b + c;
     avg = sum / 3;

     cout<<"The numbers entered are "<<a<<", "<<b<<" and "<<c<<endl;
     cout<<"The average is "<<avg;
    return 0;
}
```

**Python**

```python

a = int(input("Enter First Integer: "))
b = int(input("Enter Second Integer: "))
c = int(input("Enter Third Integer: "))

print ("The numbers entered are ", a, ", ", b, " and ", c)
sum = a + b + c
avg = float(sum / 3)
print ("The average is ", avg)

```

# Programming Life Cycle

## Phase 4: Testing and Debugging

- Detecting syntax or logic error
  - **Syntax errors** occur when a program does not conform to the grammar of a programming language, and the compiler cannot compile the source file.
  - **Logic errors** occur when a program does not do what the programmer expects it to do.
- **Testing** is done by the tester to identify the defects in the system (actual result of test case execution is not matching with expected result**.**
- **Debugging** is the activity performed by developers to fix the defect in the system.

# Programming Life Cycle

## Phase 5: Maintenance and Documentation

- Maintenance includes modification made to the program, adapting systems to changing environments, or improving the quality of the program.
- Documentation is a written detailed description of the programming life cycle including:
  - Description of the program
  - Design tools – flowchart, pseudo code
  - Record descriptions / Program listing
  - Testing results
  - Comments

# Programming Life Cycle

# PROGRAM ALGORITHM TOOLS

# Program Algorithm Tools

## Tool 1: Flowchart

- A **flowchart** is a type of diagram that represents an algorithm, workflow or process.
- The flowchart shows the steps as **boxes of various kinds**, and their order by **connecting the boxes with arrows**.
- This diagrammatic representation illustrates a **solution model** to a given problem.

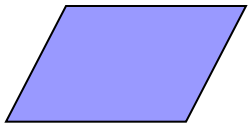
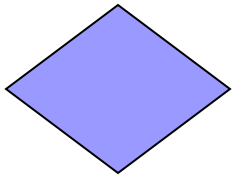
# Program Algorithm Tools

## Tool 1: Flowchart

- **Online** editing
  - https://www.lucidchart.com
  - https://creately.com
  - https://office.live.com/start/Visio.aspx?auth=2&nf=1
- **Offline** editing
  - https://www.yworks.com/
  - https://www.edrawsoft.com
  - https://conceptdraw.en.softonic.com
  - https://dia.en.softonic.com/
  - https://www.calligra.org/

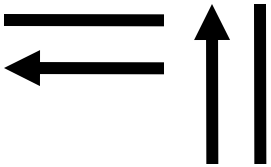
# Program Algorithm Tools

## Tool 1: Flowchart

| | | |
|---|---|---|
|  | Terminal | **Indicate starting (START) and ending (END) points.** |
|  | Input/Output | **Designate input or output operations.** |
|  | Decision | **Represent the true/false statement being tested in a decision symbol.** |
|  | Process | **Process such as a mathematical computation, or a variable assignment.** |

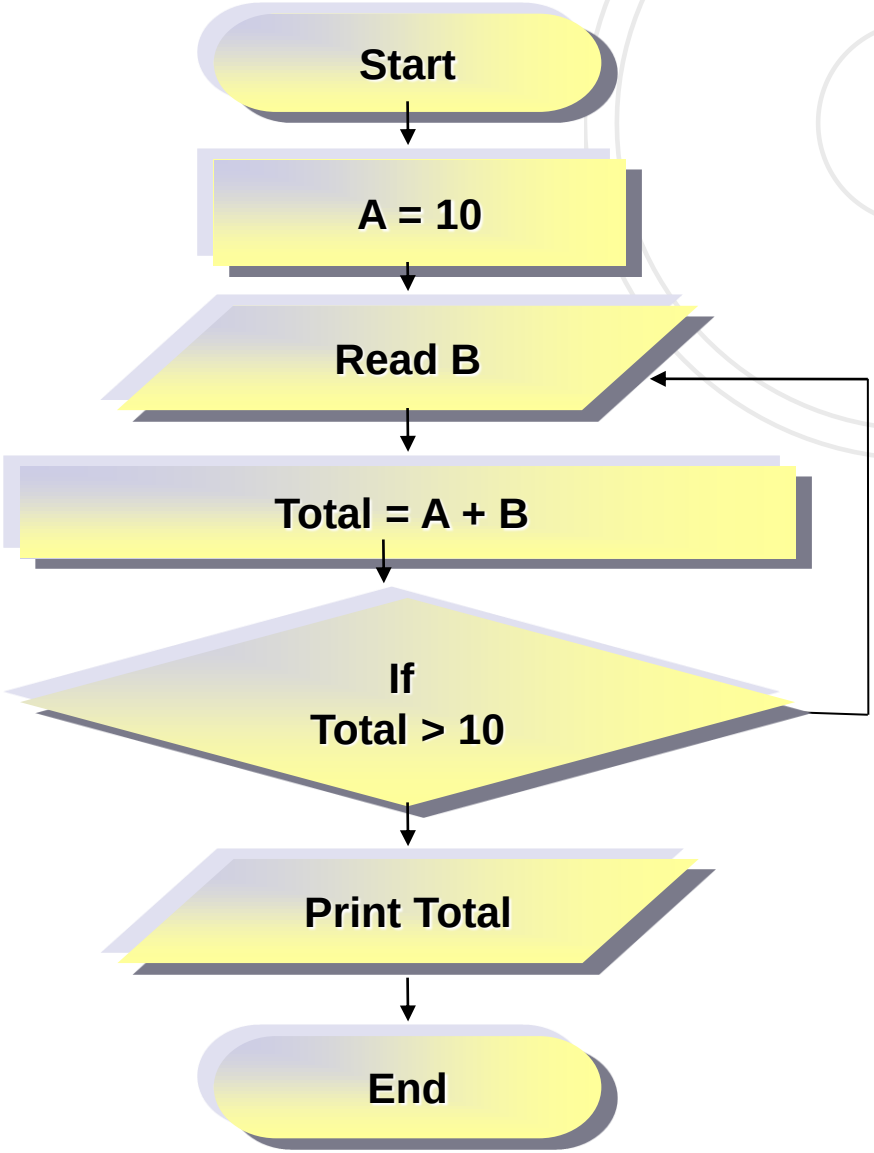
# Program Algorithm Tools

## Tool 1: Flowchart

| | | |
|---|---|---|
|  | Connector | **Connect two flowcharts on the same page.** |
|  | Flow lines | **Flow/order of problem solving.** |

# Program Algorithm Tools

Example



# Program Algorithm Tools

## Tool 2: Pseudo Code

- **Pseudo code** is an implementation of an algorithm in the form of annotations and informative text written in plain English.
- Use **singular** instructions as statements.
- The order of execution of the statements is from top to bottom, **except** when using control structures, functions and exception handling.
- Keywords **cannot** be used as variable names.

# Program Algorithm Tools

## Tool 2: Pseudo Code

- Common input-output and processing operations:
  - **START / END**: This is the start / end of your pseudocode.
  - **INPUT**: This is data retrieved from the user through typing or through an input device.
  - **READ / GET**: This is input used when reading data from a data file.
  - **PRINT, DISPLAY, SHOW**: This will show your output to a screen or the relevant output device.
  - **SET, INIT**: To initialize values
  - **INCREMENT / DECREMENT**: To increase/reduce the value of a variable
  - **IF-ELSE-IF**: to provide statements to be executed if a certain condition is met.
  - **CASE**: to compare a single variable against several conditions.
  - **FOR / WHILE**: runs the code within the loop for each element.

# PROBLEM SOLVING

# Problem Solving

In groups of 3 to 4, draw a **flowchart** and a **pseudo** code of a program that can calculate price of items after 25% discounts. Find the sale price. Display the original and the sale price.

# GOOD PRACTICES IN PROGRAMMING